OPTIMIZATION OF BIOSURFACTANT PRODUCTION BY NON-PATHOGENIC BACTERIA FROM ENVIRONMENTAL SAMPLES

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Abstract

Forty five isolates obtained from crude oil polluted soil samples were screened for their ability to produce biosurfactant using three different media; nutrient broth, mineral salt medium +2% glucose and nutrient broth +3% glycerol. Biosurfactant production was detected by a reduction in the surface tension of their supernatant and nine isolates were positive based on the screening. The next stage is to identify the non-pathogenic isolates, assessing the cytotoxicity of their biosurfactant and improving the rate of production.

Introduction

Biosurfactants refers surfactants that can be produced by different microorganisms. The biotechnological development of biosurfactant has now gained world-wide scientific and industrial attention due to their outstanding features. Their potential application include; bioremediation, enhanced oil recovery, manufacturing of drugs, foods detergents, and cosmetics. However, the industrial scale production and application of biosurfactants is still an unachieved task due factors which one of them includes; pathogenicity of biosurfactant producing organism. This research has been designed to identify safe non-pathogenic biosurfactant producing bacteria, assess the cytotoxicity of their biosurfactant and improve the rate of production with the aim of introducing these organisms as biological factories for production of household and health care products.

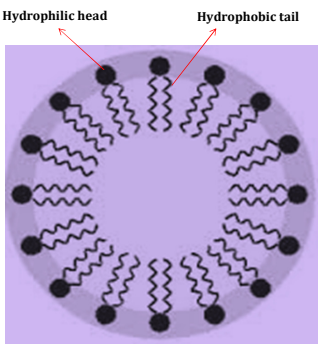
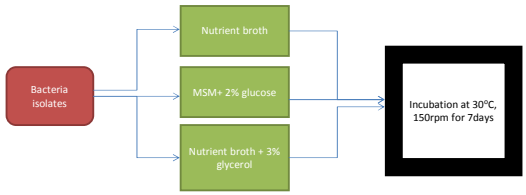


Fig1. Structure of a typical surfactant

Method

Biosurfactant production in three media

The forty five isolates obtained from oil-contaminated soil A and soil B were screened for their ability to produce biosurfactant in three different media; nutrient broth, mineral salt medium (MSM)+2% glucose and nutrient broth + 3% glycerol.



Detection of biosurfactant production

After incubation, the cell free supernatant were analysed for reduction in their surface tension which is an indication of biosurfactant production. This reduction in surface tension was measured by the Du-Nouy ring method using an automated tensiometer. The principle of this measurement is usually based on measuring the force required to detach a metal or platinum loop of wire from an interface or surface. The detachment force of the ring, is proportional to the surface tension and is displayed on the tensiometer.

Results and Discussion

The results obtained from this work demonstrated that nine isolates out of the 45 are potential biosurfactant producers based on reduction in their surface tension. However, these isolates showed varying surface tension measurement in the different media, explaining that medium composition could be a contributory factor to biosurfactant production (Fig 2, 3). Surface tension measurement ranging from 27 to 32 mN/m is a strong indication of surfactant production by microbes.

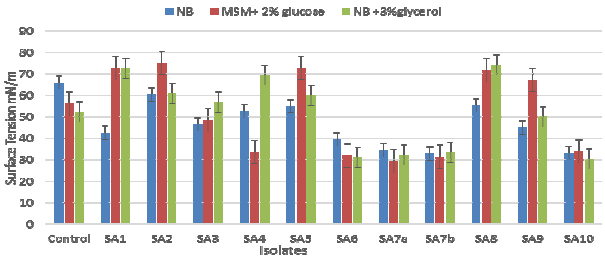


Fig 2. Mean surface tension measurement for day 4 soil A isolates

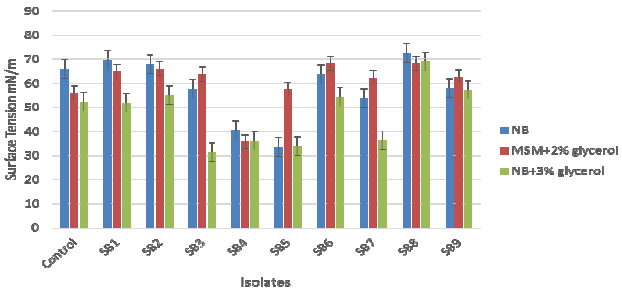
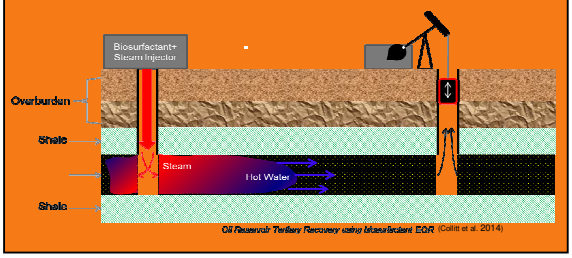


Fig 3. Mean surface tension measurement for day 4 soil B isolates

Conclusion

Biosurfactants are better alternatives to the chemical surfactants, showing features such as environmentally friendliness, non-toxicity to humans, effectiveness at different conditions and different industrial applications.



References

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Next steps

The next stage of this work involves molecular identification and sequencing of these positive surfactant producers, extraction of their biosurfactant, assessing the cytotoxicity of biosurfactant and different potential industrial application.